

system here presented has the support of much better evidence than that for atomic evolution from the standpoint of astronomy alone.

We wish to thank Professor A. C. Lunn of the Department of Mathematics, for outlining for us the method for determining the distances between the positive and negative electrons.

- ¹ Moseley, *Phil Mag.*, London, 26, 1024; 27, 703.
- ² Lorentz, *The Theory of Electrons*, p. 47.
- ³ K. Fajans, *Physik. Zs.*, Leipzig, 14, 131 and 136.
- ⁴ F. Soddy, *Chem. News*, London, 107, 97; *Jahrb. Radioakt.*, 10, 188.
- ⁵ Russell, *Chem. News*, London, 107, 49.
- ⁶ Von Hevesy, *Physik. Zs.*, Leipzig, 14, 49.
- ⁷ Fleck, *Trans. Chem. Soc.*, 103, 381 and 1052.
- ⁸ Rydberg, *Zs. anorg. Chem.*, Hamburg, 14, 86-7.
- ⁹ Richards and Willard, *J. Amer. Chem. Soc.*, 32, 4 (1910).
- ¹⁰ W. A. Noyes, *Textbook of Chemistry*, p. 72.
- ¹¹ Hale, *The Study of Stellar Evolution*.

HUNTINGTON'S CHOREA IN RELATION TO HEREDITY AND EUGENICS

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It is now generally conceded that predisposition plays an important rôle in mental disorder but the views as to the nature of its part are very diverse and hazy. Some investigators conclude that there is an inheritance of a particular type of mental trouble, while others conceive that only a general psychopathic constitution is inherited. Again a difference of view maintains as to the nature of the recognized mental 'diseases'—by some these are regarded as distinct 'entities,' manifestations of a single, indivisible, disturbing factor. Others conceive of them as syndromes or chance associations of symptoms. Even those who hold the latter view would perhaps except as the one clear case of a neuropathic entity the condition known as 'Huntington's Chorea.' This chorea is defined by the following traits: (1) persistent tremors of the head, appendages and trunk; (2) the onset of such tremors in middle or late life; (3) the progressive nature of the tremors; and (4) progressive mental deterioration. These characters are frequently found together; is their association a necessary one?

A study of four family complexes in eastern Long Island, south-western Connecticut, south-central Connecticut and eastern Massachusetts which show nearly a thousand cases of Huntington's chorea yields the

remarkable result that practically all can be traced back to some half-dozen individuals, including three (probable) brothers who migrated to America during the 17th century. But, already, numerous 'biotypes' having specific and differential hereditary behavior have appeared. Thus there is a biotype in which the tremors are absent but mental deterioration present; a biotype in which the tremors are not accompanied by mental deterioration; a biotype in which the chorea does not progress; and a biotype in which the onset of the choreic movements is in early life. In general, the symptomatology of chronic chorea is dissimilar in different strains of families. The age of onset, the degree of muscular involvement, the extent of mental deterioration all show family differences and enable us to recognize various species, or biotypes, of the disease. These biotypes are less striking than they would be were it not for the extensive hybridization that is taking place between biotypes in random human matings.

The method of inheritance of some of the elements of Huntington's chorea has been worked out. In general, the choreic movements never skip a generation and in other respects show themselves clearly to be a dominant trait. The mental disorder is usually of the hyperkinetic or manic type and this also shows itself as a dominant. The age of onset *apparently* tends to diminish in successive generations—'law of anticipation'—but this is partly, if not wholly, illusory and is due to the fact that in comparing the age of onset in grandfathers with that in grandchildren we are not comparing on the same basis, for the grandparents are a selected lot (selected on the basis of late onset—at least late enough for them to become parents), while grandchildren include those in whom the onset is so early in life that they will never marry. If instead of comparing the average age of onset in successive generations, one compares the age of onset in a number of choreic parents, *their* parents and their grandparents, then the evidence for anticipation vanishes. Eight such series give for average age of onset of the propositus 35.5 years, parent 38.8, grandparents 36.9. In this series we can see no evidence of anticipation.

Among the 3000 odd relatives of the 962 choreics studied many nervous traits are recorded. Thus epilepsy is recorded 39 times, infantile convulsions 19 times, meningial inflammations and brain fever 51 times, hydrocephaly 41 times, feeble-mindedness 73 times, Sydenham's chorea 11 times, and tics 9 times, mostly in one small family. This incidence, which would seem high for an unselected population, suggests that chorea occurs in families characterized by a general liability to nervous and mental troubles.

Though it can be shown that the 962 cases of chorea originated from 6 or 7 ancestors and that the tendency has been handed down almost without a break through the generations and that for generations there have been individuals who recognized the hereditary nature of the disease and were influenced in marriage accordingly; nevertheless, there is no clear evidence that persons belonging to the choreic lines voluntarily abstain to any marked degree from, or are selected against, in marriage.

THE ALCYONARIA AS A FACTOR IN REEF LIMESTONE FORMATION

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The early students of coral reef formation based their conclusions concerning the depth at which reef formation could take place and the rate at which material was added to such reefs upon the known bathymetrical distribution and growth rate of stony corals (*Madreporaria*). The results obtained from the examination of the cores from borings made at the Island of Funafuti in the South Pacific showed that, in this particular region at least, calcareous algae of the genus *Halimeda* were a very important factor in reef limestone formation. Among the other group of lime secreting animals, those species of Alcyonaria, which form a massive skeleton have received proper recognition as contributing to reef formation. The remaining representatives of this group have been neglected as reef formers because their limy secretion is laid down in the form of minute spicules which are set free at the time of the disintegration of the living tissues of the colony leaving no recognizable skeleton.

On most coral reefs in all parts of the world the Alcyonaria with free spicules are much more abundant than those forming a massive skeleton while in many regions they constitute by far the greatest part of all lime secreting organisms living permanently attached to the bottom. On many reef areas in the Florida-Antillean region the areas occupied by stony corals and calcareous algae are relatively small while flexible alcyonaria or the family Gorgonaceae make up the most characteristic feature of the fauna. The spicules of these organisms are found in practically all bottom samples both from the crests of the reefs and in the soft mud from the channels between the reefs so it is evident that they may be incorporated into the reef limestones before they have undergone marked erosion.